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24

NICOTINE INJECTION OF LODGEPOLE PINE IN RELATION TO MOUNTAIN PINE BEETLE ATTACKS

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FOREST INSECT
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Berkeley, California
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Dr. F. C. Craighead
Washington, D. C.

Dear Dr. Craighead:

I am enclosing a brief report by Mr. Struble, giving results of an attempt made last summer to inject lodgepole pine with pure nicotine. Dr. Gordon was particularly optimistic about this material, and a special effort was made to test it before his appointment was terminated. Gordon prepared the material and planned the experiment which was carried out by Struble.

The fact that D.m. broods failed to develope in the injected trees, but were successful in the check, may be of some significance or it may have been due to chance selection of resistant trees. Further tests will certainly benecessary before results will be conclusive.

Very truly yours,

J.C.Miller
Senior Entomologist

Jmm/fhm

Enclosure

NICOTINE INJECTION OF LODGEPOLE PINE IN RELATION TO MOUNTAIN PINE BEETLE ATTACKS

In a supplementary test of the injection method of bark beetle control pure nicotine in diluted and concentrated solutions was tried out in lodgepole pine during 1934 at the suggestion of A. Gordon. The possibility that pure nicotine would have certain advantages over a long series of organic and inorganic chemicals tried out in previous tests was suggested because it is a plant product and, therefore, would likely be non-toxic to plant tissue. At the same time it would have a harmful effect on bark beetles. Pure nicotine has seldom been used in previous tests, possibly because of the danger in handling.

Methods.- The saw kerf method of injection was used. Briefly, this was done by cutting channels 6 inches wide on opposite sides of the tree to a depth of 4 to 6 annual rings, and connecting them by means of a hole drilled through the trunk. After cleaning out saw dust each kerf was sealed by means of rubber tubing and airplane dope. The solutions were injected by suspending a two-liter bottle about 2 feet above the injection point to which it was connected by rubber tubing.

Four medium to slow growing lodgepole pines between 6 and 8 inches in diameter were injected on June 16. In three of them 2 liters of 10 per cent solution was used, while in the fourth 10 grams of concentrated 95 per cent nicotine was injected. The solutions had been completely absorbed by June 18. A fifth tree of similar description to those injected was selecte as an untreated check tree.

Insect tight copper screen cages were constructed to enclose a portion of the trunk on all 5 trees as soon as the solution had entered. D. monticolae adults taken from an infested lodgepole pine were admitted to the cages between July 4 and 9. The number introduced was approximately twenty to the square foot of caged bark area.

Results.- 1. Injury. Cambium injury was evident in all trees injected after a period of one month. Narrow bands of apparently deadened cambium, running upward for several feet from each saw kerf were found in the three trees injected with 2 liters of 10 per cent solution. The injury on tree 4, injected with concentrated nicotine, was localized around the point of injection. On October 5, nearly 4 months after injection, no cambiu injury was evident in any of the trees and no odor of nicotine could be detected. In tree 1 the sapwood was slightly stained in spots.

Needle injury was negligible. In trees 1, 2 and 3 some of the needles of the basal branches were dead. All remaining foliage was normal.

2. Success of beetle attacks. The attacks on all injected trees failed; those on the check tree resulted in normal broods. In every case egg galleries were constructed and in some eggs were laid. In tree 4 larvae hatched but died. Heavy pitch flows were evident in all injected trees. Detailed data are presented in the following table:

Table 1. Summary of Results

Tree Number	Diameter	% Solution	Amount	Area Caged per sq. ft.	Adults admitted	Attacks	Inches of Egg Gallery	Remarks
1	8	10	2 lit.	13	260	28	104	All attacks pitched out.
2	8	10	2 "	12	200	11	56	Eggs in one gal. All pitched out.
3	6	10	2 "	6	125	7	34	All attacks pitched out
4	6	95	10 gms.	6	125	44	457	Young larvae all dead
5	6	check		6	130	67	746	½ to ⅔ grown larvae

Conclusions.- These results indicate that nicotine may be of importance in hindering the progress and development of the mountain pine beetle. It did not repel adults or prevent them from making normal attacks and egg galleries. Whether the nicotine actually stimulated the production of more resin is conjectural, since the check tree showed no such resin flows. The presence of small quantities of nicotine in the cambium while insufficient to appreciably harm the adult beetles may have been detrimental to developing broods.

Further experiments using diluted solutions of pure nicotine should be carried out to determine the possibilities of this material for protecting living trees.

G. R. Struble,
Assistant Entomologist

Berkeley, California
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